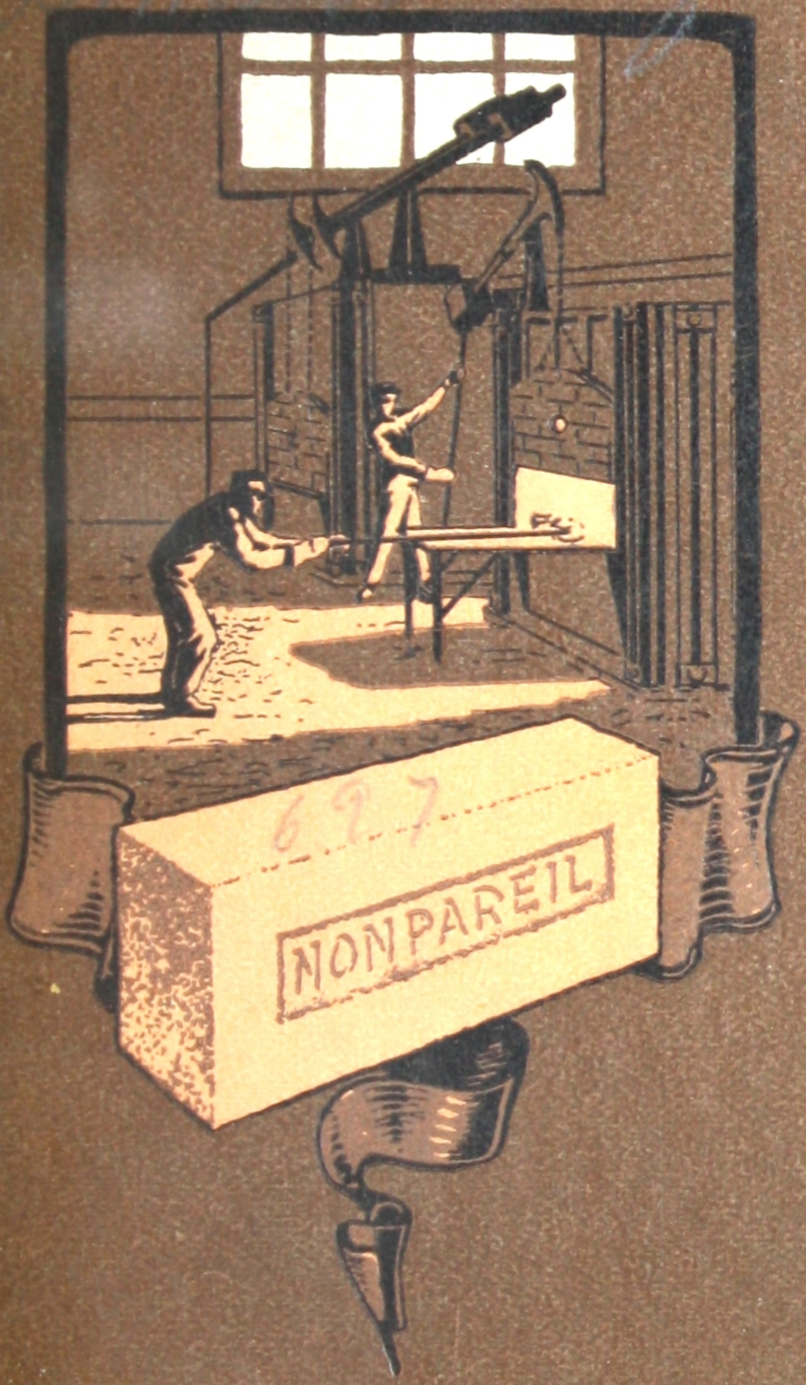
GOOD FURNACES MADE BETTER

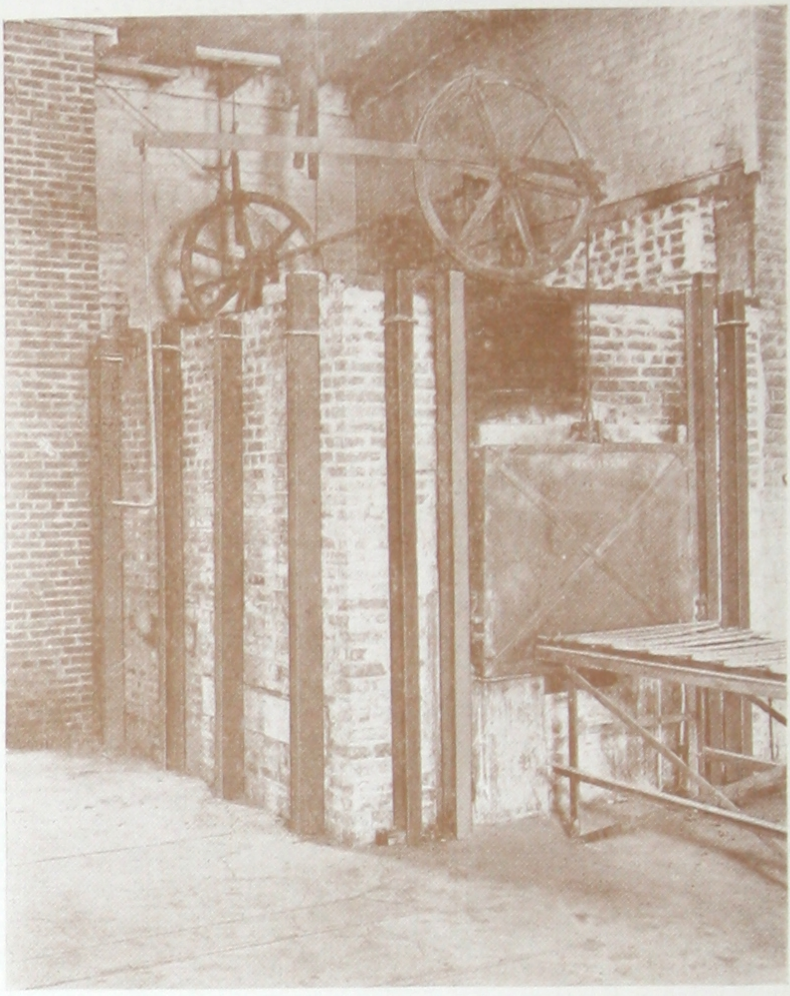


NONPAREIL
Insulating Brick
for Furnaces & Ovens

NONPAREIL
Reg. U. S. Pat. Off.

ARMSTRONG CORK &
INSULATION COMPANY
PITTSBURGH, PA., U. S. A.

Branches or Representatives in the Principal Cities of the United States & Canada



Enameling furnace insulated throughout with a single course of Nonpareil Insulating Brick placed between the fire brick and the red brick. Maryland Enamel & Sign Company, Highlandtown, Md.

Nonpareil Insulating Brick

WITHIN recent years so many improvements have been made in furnace and oven design and so much has been done to eliminate waste of fuel, that economy in heating operations is now the rule rather than the exception. In fact, most of the heat losses due to faulty design and construction have been materially reduced, with the exception of the loss due to radiation from the walls and arches. That this loss still exists is due, not to neglect or ignorance of its importance, but to the lack of a suitable insulating material.

The Necessary Requirements

Government tests* have shown conclusively that air-spaces in the walls have little or no insulating value, and loose materials such as magnesia, asbestos, mineral wool, etc., are not well-suited for this service. In fact, none of the materials heretofore available has possessed all of the qualities essential for this purpose, viz:

1. Low heat conductivity;
2. Convenient form for handling and installing (such as brick);

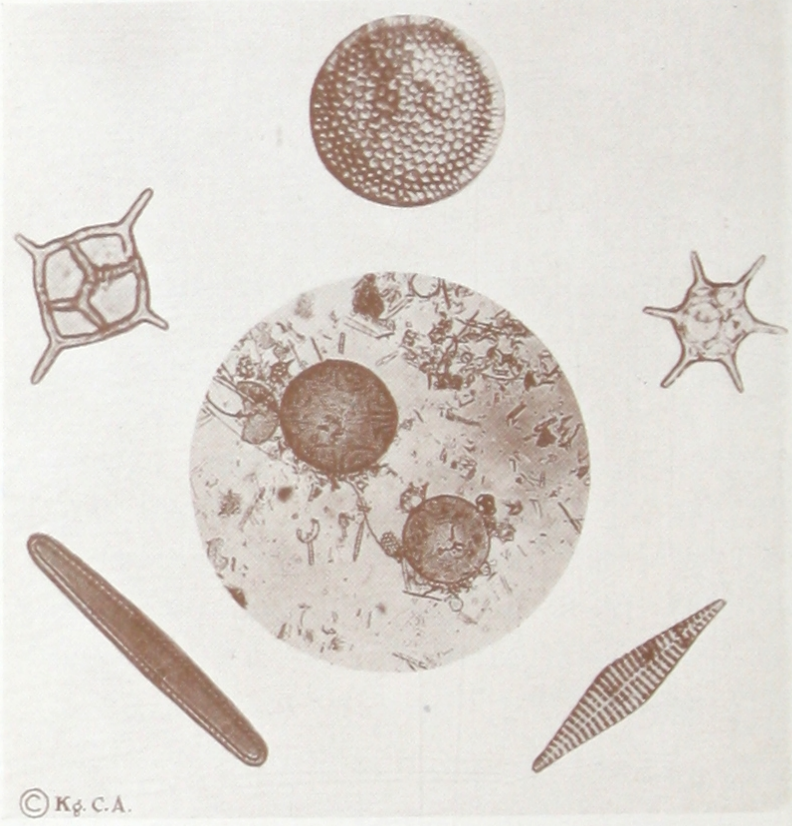
* See Bulletin No. 8 of U. S. Bureau of Mines.

3. Sufficient strength to be built in the walls and arches;

4. Ability to withstand relatively high temperatures;

5. Moderate cost.

Nonpareil Insulating Brick more nearly approximate these requirements than any insulating material yet placed on the market.



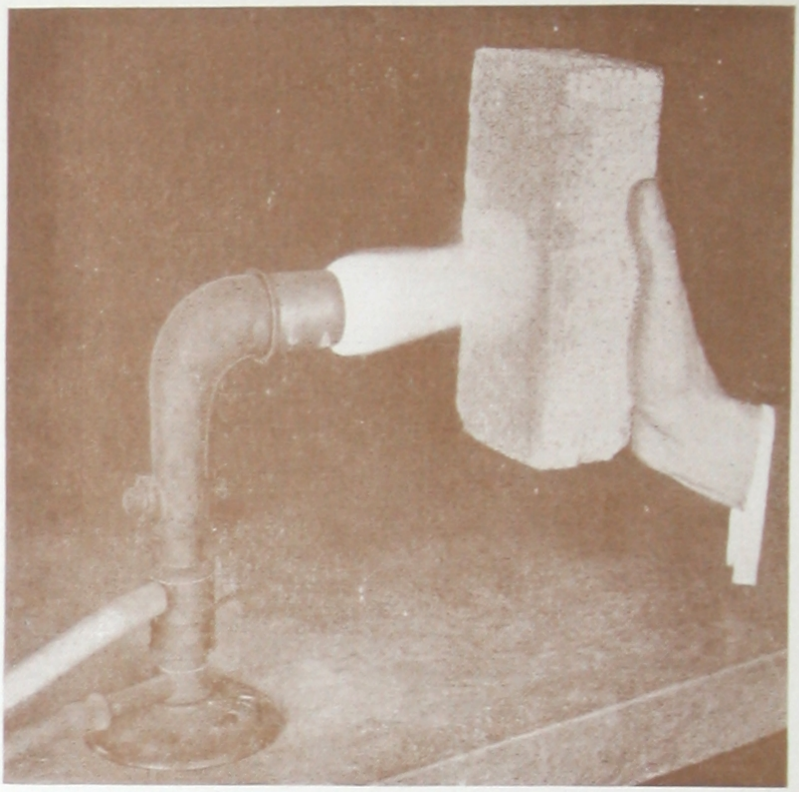
The central photograph shows diatomaceous earth under the microscope. It is composed of millions of small diatoms. The other photographs show the different forms of diatoms which compose this peculiar substance. Each one is hollow and filled with air.

What They Are

Nonpareil Insulating Brick are composed principally of diatomaceous earth. This latter material is practically pure silica, consisting of myriads of shells or skeletons of marine plants, known as diatoms, which existed ages ago in the waters that then covered the earth. The shells of these diatoms are quite small; so small, in fact, that scientists estimate it takes thirty-nine billion of them to fill one cubic inch of space. Each of these shells is hollow, and the air in them is confined in such minute particles that no circulation can take place. In making Nonpareil Insulating Brick, the diatomaceous earth is mixed with finely ground cork, molded into proper form and then fired. The cork is burned out, leaving the brick extremely porous in structure.

Insulating Efficiency

"Dead air" or in other words, air that cannot circulate, has long been recognized as the best insulating medium known (except a vacuum). As Nonpareil Insulating Brick contain not only the "dead air" confined in the diatoms, but also that in the pores formed when the cork is burned out, their insulating efficiency, or ability to hold in the heat, is exceptionally high. This is easily demonstrated by the following simple test: Let the hottest gas flame you



Blow pipe test on Nonpareil Insulating Brick.

can find play against the 4½-inch face of a Nonpareil Brick. Long after the side exposed to the flame has become white hot, you will be able to hold your hand on the opposite side without discomfort. If you will try the same experiment with a common brick, you will not be surprised to learn that the Insulating Brick transmit but one-tenth as much heat as common brick or fire brick. In other words, a Nonpareil Insulating Brick wall 4½ inches thick gives the same heat insulating effect as a wall of common brick or fire brick 45 inches thick. This has been proven by actual tests.

Brick Form

The standard straight brick is nominally 9x4½x2½ inches. Various other shapes for arches, circles, etc., as shown on page 20, are also carried in stock. For the purchaser's protection, each brick is stamped with the trade-mark "NONPAREIL."

Convenient Form

The convenient form of Nonpareil Brick makes them especially well suited for insulating purposes in furnace and oven construction. Being the same size as fire brick, the courses of Nonpareil Brick in the walls and arches are readily bonded with the fire brick, making the insulation an integral part of the structure and in no way decreasing its stability. With insulating materials in loose form, it is necessary to build the inner and outer walls independent of each other, leaving an open space between to be filled with the insulating medium. The solid walls made possible by using Nonpareil Brick undoubtedly provide a much stronger type of structure.

Crushing Strength

With Nonpareil Insulating Brick there is little or no danger of crumbling under pressure. They will sustain a crushing load of 140 pounds per square inch—20,160 pounds per square foot, which is sufficient for any load that will be encountered under average conditions.

Resistance to High Temperatures

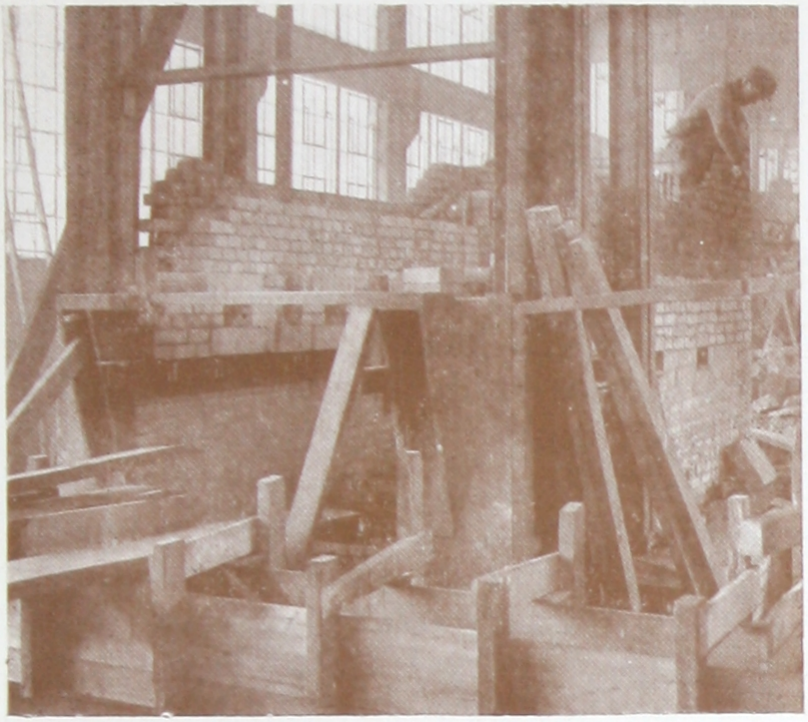
Nonpareil Insulating Brick are not a refractory material in any sense of the word, nor should they be used as such. Their function is to back up fire brick in any place where it is desired to retain heat. Repeated tests have shown, however, that they will withstand temperatures up to 1800° F. without shrinkage or change of form. This is higher than any temperature they will be subjected to, if correctly installed and protected by fire brick.

Moderate in First Cost

The cost of Nonpareil Insulating Brick is very reasonable and, in most cases, the fuel saved by using them will soon pay for their installation. In figuring the cost of installing them, it should be borne in mind that they displace a corresponding number of fire brick or common brick, the value of which should be deducted in making a comparative estimate.

Light in Weight

The straight Nonpareil Brick, 9x4½x2½ inches, weigh about 1.5 pounds each or 27 pounds per cubic foot, as compared to about 150 pounds per cubic foot for fire brick—less than 1/5 as much. This fact is of importance when it is necessary to install furnaces or ovens on the upper floors of a building, as the saving in weight over fire brick or common brick is considerable.



Constructing an annealing furnace insulated with Nonpareil Brick at Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Economy of Operation

As an example of the economy which results from the use of Nonpareil Brick, let us take an oil-fired heat treating furnace operating with a heating chamber temperature of 1600° F. With the outside air at 70° F. the difference in temperature between the inside and outside will be 1530° F. With the walls of fire brick, 13½ inches thick, the loss of heat per square foot of exposed surface will be 7554 B. T. U.* per 10 hour day. If the walls were constructed of 9 inches of fire brick and 4½ inches of Non-

* One B. T. U. (British Thermal Unit) is the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit.

pareil Insulating Brick, it would be equivalent to making them 54 inches thick; for Nonpareil Brick have ten times the insulating value of fire brick and the 4½ inches of Nonpareil Brick would, therefore, be equal to 45 inches of fire brick in retaining heat.

The amount of heat passing through a wall varies inversely as its thickness. The wall in which the Insulating Brick were used would then transmit only 13½/54 or 1/4 as much heat as the uninsulated wall; in other words, 1/4 of 7554, or 1888.5 B. T. U. per 10 hour day. The saving due to the insulation would be 7554 less 1888.5 or 5665.5 B. T. U. per 10 hour day. In a working year of 300 days, this would amount to 5665.5 x 300, or 1,699,650 B. T. U. This is equivalent to 12.7 gallons of fuel oil. With oil at 3½c per gallon, the saving would be 44c per square foot of exposed wall and arch surface.

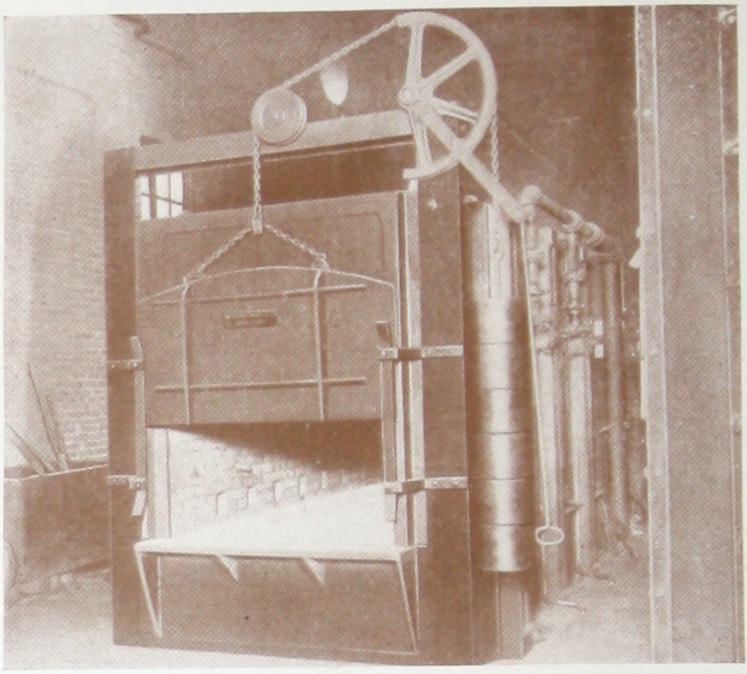
The cost of installing one square foot of Nonpareil Brick is about 30c. Adding 10% for interest and depreciation, this amounts to 33c. Deducting 12c per square foot for the outer course of fire brick, which the Insulating Brick displaced, leaves 21c as the net cost of the insulation. This 21c expenditure, then, saves 44c per year, per square foot—a return of over 200% on the investment. In other words, the Nonpareil Insulating Brick will pay for themselves, under the above stated conditions, in less than six months' time.

Applications

Though Nonpareil Insulating Brick have been on the market but a comparatively short time, the results obtained are sufficient to prove that their use is amply justified in heat-treating, forging, melting, glass tank, enameling, and practically all kinds of furnaces; japanning, lacquering, mold drying and core baking ovens; kilns for burning pottery, brick, sewer pipe, etc.; gas producers, waste heat mains, boiler settings, breechings, stacks and innumerable other places that will at once suggest themselves to engineers, superintendents and managers of industrial plants. The use of Nonpareil Brick in boiler settings is covered in another booklet, "Saving Fuel," which will be sent on request.

In Heat Treating Furnaces

The extensive increase in the heat treatment of steel and other metals in recent years has focused attention on the desirability of carrying out such operations as economically as possible. Fuel, of course, is one of the chief items of expense, and here a material saving can be effected by the installation of Nonpareil Insulating Brick. While no actual figures are available at this time, the experience of various users of the brick bears out the truth of this assertion.



Heat treating furnace insulated with Nonpareil Brick.
Constructed by W. S. Rockwell Co., New York.

For some months the General Electric Company have been using Nonpareil Brick at their Schenectady Works for insulating oil and electrically heated furnaces. After giving the brick a thorough trial, they expressed themselves as being well-satisfied with the results obtained.

The W. S. Rockwell Company, furnace builders, New York City, have been large users of Nonpareil Brick in their furnaces, and on December 8th, 1914, expressed themselves as follows:

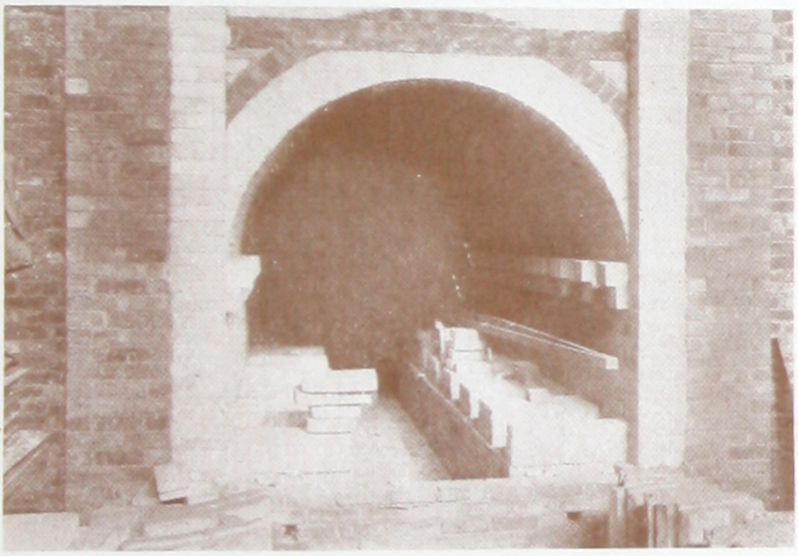
"Referring to the Insulating Brick purchased from you, we are using them in connection with our furnaces and find them very satisfactory."

The comments of Mr. John M. Nelson of Royal Oak, Mich., a practical furnace erector, show the value of Nonpareil Insulating Brick. He wrote as follows on August 9th, 1911:

"I * * * am at present with the Ford Motor Company of Detroit, having superintended the laying of all the Insulating Brick you sent them. I must say that they are the greatest insulating brick in existence, and am using them in all kinds of shapes and places. I have, in my thirty years of experience in furnace work, had more trouble with insulation than anything else and know how to appreciate your brick."

In Enameling Plants

Among the first users of Nonpareil Insulating Brick were the Ingram-Richardson Manufacturing Company, Beaver Falls, Pa., one of the largest makers of enameled



Enameling furnace insulated with Nonpareil Brick. Ingram-Richardson Co., Beaver Falls, Pa. The inner lining of fire brick backed up by the darker colored Insulating Brick may be clearly seen.

signs in the United States. After having had the brick in service for one year in their enameling furnaces, they wrote:

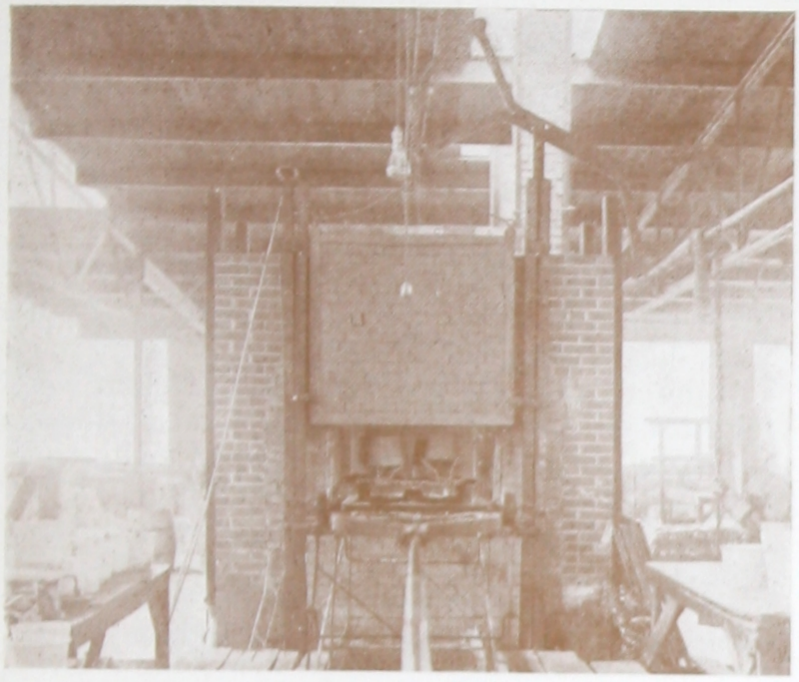
"We are very pleased, indeed, with the results that have been obtained from the use of these (Nonpareil) brick, and unhesitatingly recommend them for furnace purposes."

For Furnace Doors

No one who is familiar with furnace operation needs be told of the large amount of heat that is radiated through furnace doors. To prevent this loss, many have discarded the heavy cast iron doors, and have replaced them with doors of Nonpareil Insulating Brick held together with light steel channel frames. Not only is the radiation loss greatly reduced, but the weight of the doors is materially lessened, simplifying the mechanism and reducing the labor necessary for raising and lowering them. The experience of the Ingram-Richardson Manufacturing Company is again of interest on this point:

"We have also been very successful in reducing the temperature of our furnace room on account of the use of your Nonpareil Brick in our furnace doors, which reduces the hardships of our workers during the hot weather.

"We also find some advantage in the extremely light weight of the brick, which reduces the wear and tear, considerably, on our furnace door mechanism, and we are very pleased to go on record as indorsing your brick for such purposes as we use them."



Door of enameling furnace constructed of Nonpareil Brick held in steel frame. Fletcher Enamel Co., Dunbar, W. Va.

In Ovens

The temperatures employed in ovens for japanning, lacquering, mold drying, core baking, etc., are not high, as compared with those in furnaces, and the volume of heat lost by radiation is, therefore, not so large. On the other hand, expensive gas fuel is often used, so that it is just as essential to insulate ovens properly as it is furnaces. In many types of ovens, with sheet metal walls and little or no insulation, much more heat is radiated into the atmosphere than is used for baking. This point was brought out quite forcibly by Mr. Dexter Rollins, of the General Electric Company, in his paper, "Industrial Electric

Heating as Power Business," read before an association of Central Station Engineers in Cincinnati, Ohio, November 20th, 1914. Mr. Rollins said in part:

"We * * * recommend an oven constructed of Insulating Brick, plastered on the outside; and if the truck runs on a track, the inside need not be lined with sheet steel, for the latter is costly to heat and the metal in the product is of sufficient weight for heat storage purposes. An oven of this construction, with four-inch-thick walls, will have a heat conductivity of not more than four B. T. U. per square foot, per degree difference in temperature per twenty-four hours, while in the case of the metal oven, the walls alone conduct more heat by 200% than the metal put in it to be baked."

Last year the Camden Factory of the Armstrong Cork Company replaced several ovens with new ones of similar type, insulated throughout with 4½ inches of Nonpareil Insulating Brick. A comparison of the records for five months shows a decrease in fuel consumption of 29.4% in favor of the new ovens. This shows conclusively that savings well worth while will be effected by Nonpareil Insulating Brick, even at comparatively low temperatures. In this connection, it may be mentioned that recent tests on bread-baking ovens employing temperatures of about 500° F., insulated on two sides only, have shown fuel savings of 15.6%. These tests are given in full in a booklet entitled, "Comfort and Economy in the Bakery," which will be mailed on request.

Comfort for the Workmen

Nonpareil Insulating Brick are also quite beneficial in reducing the temperature around furnaces or ovens and thus providing more comfortable working conditions for the workmen. While this saving cannot be actually figured in dollars and cents it exists, nevertheless, as it is a well-known fact that a man will do more and better work in a cool room than in a hot one. Where conditions are especially severe, as around tank furnaces in glass plants, Nonpareil Brick are often used expressly to protect the workmen from the excessive heat. The Alexandria Glass Company, Alexandria, Va., are using them for this purpose with excellent results, as is shown by the following extract from a letter written by Mr. J. W. Munroe, President:

"Regarding the Nonpareil Insulating Brick which we are using at the front of tank, we consider them far superior to water shields, for several reasons. First, more water will be used in a year than the brick will cost, and when once they are there they appear to be good for several years. Even though we have taken them down once or twice in changing one of our shops, we have lost very few, whereas the water shield is continually wearing out and requiring replacement. * * * We would very strongly recommend the use of these Nonpareil Brick wherever necessary."

List of Installations

Among those who have ordered Nonpareil Insulating Brick for use in furnaces and ovens are the following:

National Machine Works, Chicago, Ill.
Union Malleable Iron Co., E. Moline, Ill.
Deere & Co., Moline, Ill.
Baltimore Copper Smelting & Rolling Co., Baltimore, Md.
Maryland Enamel & Sign Co., Highlandtown, Md.
Ford Motor Co.. Detroit, Mich.
Michigan Malleable Iron Co., Detroit, Mich.
American Fork & Hoe Co., Jackson, Mich.
General Electric Co., Schenectady, N. Y.
Perfection Supply Co., Cleveland, Ohio.
Catasaqua Castings Co., Catasaqua, Pa.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Erie Forge Co., Erie, Pa.
General Electric Co., Erie, Pa.
American Iron & Steel Co., Lebanon, Pa.
American Bridge Co., Pencoyd, Pa.
Atlas Ball Co., Philadelphia, Pa.
International Foundry Co., Philadelphia, Pa.
Bethlehem Steel Co., South Bethlehem, Pa.
Fletcher Enamel Co., Charleston, W. Va.
U. S. Stamping Co., Moundsville, W. Va.

Methods of Installing

The usual method of installing Nonpareil Insulating Brick is to place them on the outside of the fire brick and between the courses of fire brick and common brick, in case the latter are used. Where there are no common brick on the outside, a half-inch layer of cement plaster or a sheet steel casing should be used to protect the Insulating Brick from abrasion. Ordinarily

either one or two courses of Nonpareil Brick are used, depending on the cost of fuel and the temperatures carried. Specific recommendations will be made on receipt of the necessary data.

Insulating Cement

To obtain the best results, Nonpareil Insulating Brick should be laid in special insulating cement, which we are prepared to furnish. This cement has practically the same heat-retarding properties as the brick and by using it continuous walls of insulation are obtained.

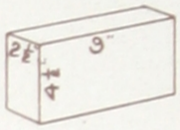
Further Information

Full size sample brick, prices and further information will be cheerfully furnished on request.

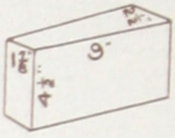
Armstrong Cork & Insulation Co.
Pittsburgh, Pa., U. S. A.

Also manufacturers of Nonpareil High Pressure Covering for steam lines, feed water heaters, etc., and of Nonpareil Cork Covering for drinking water lines, brine and ammonia piping, etc.

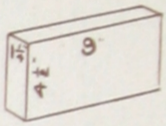
Standard Shapes and Sizes



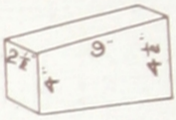
STRAIGHT BRICK.
9" × 4½" × 2½"



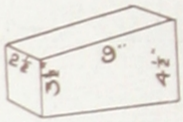
Nº 1 WEDGE.
9" × 4½" × (2½" - 1⅛")



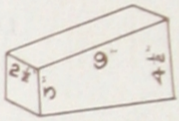
SPLIT BRICK
9" × 4½ × 1½"



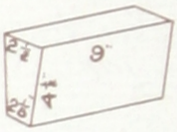
Nº 1 KEY.
9" × (4½" - 4") × 2½"



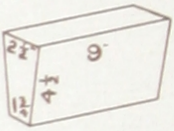
Nº 2 KEY.
9" × (4½" - 3½") × 2½"



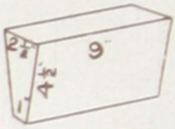
Nº 3 KEY.
9" × (4½" - 3") × 2½"



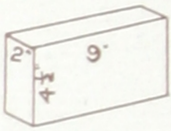
Nº 1 ARCH.
9" × 4½" × (2½" - 2⅛"



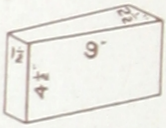
Nº 2 ARCH.
9" × 4½" × (2½" - 1¾")



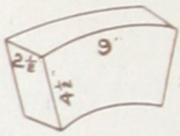
Nº 3 ARCH.
9" × 4½" × (2½" - 1")



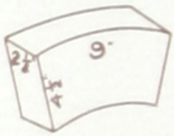
2" BRICK.
9" × 4½" × 2".



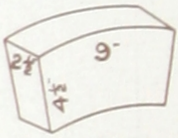
Nº 2 WEDGE.
9" × 4½" × (2½" - 1½").



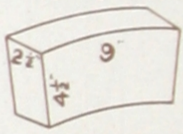
36" CIRCLE BRICK.
36" I.D. 45" O.D (9" -) × 4½" × 2½"
15 TO A CIRCLE.



48" CIRCLE BRICK.
48" INS. DIA. 57" OUTS. DIA.
20 TO A CIRCLE.
(9" -) × 4½" × 2½"



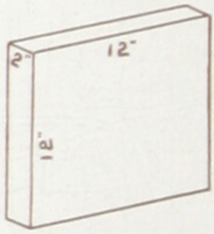
60" CIRCLE BRICK.
60" INS. DIA. 69" OUTS. DIA.
25 TO A CIRCLE
(9" -) × 4½" × 2½"



72" CIRCLE BRICK.
72" INS. DIA. 81" OUTS. DIA.
28 TO A CIRCLE.
(9" -) × 4½" × 2½".

SPECIAL SIZES.

STRAIGHT BRICK.
9" × 4½" × 3"



STRAIGHT BRICK.
12" × 12" × 2".

Shapes and sizes in which Nonpareil Insulating Brick are made.

NONPAREIL

TRADE MARK